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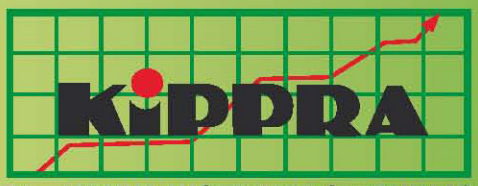

The KENYA INSTITUTE for PUBLIC POLICY RESEARCH and ANALYSIS

The Effect of Science, Technology, Engineering and Mathematics Skills on Youth Employment in Kenya

Grace Mukami Muriithi
William Mulei Musili

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THE KENYA INSTITUTE FOR PUBLIC POLICY RESEARCH AND ANALYSIS (KIPPRA)

YOUNG PROFESSIONALS (YPs) TRAINING PROGRAMME

The Effect of Science, Technology, Engineering and Mathematics Skills on Youth Employment in Kenya

Grace Mukami Muriithi
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Kenya Institute for Public Policy
Research and Analysis

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Abstract

The choice of the employment sector is influenced by several individuals' characteristics, among them the Science, Technology, Engineering and Mathematics (STEM) skills. In this study, the paper seeks to determine the effects of STEM skills on youth employment in the private sector, public sector and self-employment. The paper further seeks to examine the effect of STEM skills on the type of employment contract among Kenyan youths categorized as permanent, temporary and fixed-term contracts. The study used secondary data from the World Bank Skills Towards Employability and Productivity (STEP) household wave-3 survey. The survey involved a stratified three stage sample design in collecting information on 3,894 households. Multinomial logit was used to analyze the effects of STEM skills on youth employment and the type of employment contract. The key findings of the study reveal that youth with STEM skills are more likely to be in self-employment and in temporary contracts. Overall, the public sector is less likely to employ youths with STEM skills and, therefore, STEM opportunities are mainly in the private sector and self-employment. Other factors such as experience, level of education by STEM skills, and job search duration were found to be significant in determining employment of youth and the type of employment contract. Youths with STEM skills were more likely to be employed in the private and self-employment sectors. Given that the public sector is the least of the employers for youths with STEM skills, the study recommends creating an enabling environment and conducive environment for the private sector and self-employment to absorb more youths in STEM. Secondly, there is potential in self-employment of STEM skills graduates. There is need, therefore, to incentivize youths with STEM skills and in self-employment to attract more, expand and become employers. Lastly, experience increases the chances of getting employed and, as such, there is need to invest more in internships, apprenticeships, and trainee management to equip the youths with on-job training after formal education.

Abbreviations and Acronyms

AfDB	African Development Bank
CEMASTEA	Centre for Mathematics, Science and Technology Education in Africa
EAC	East Africa Community
GoK	Government of Kenya
ILFS	Integrated Labour Force Survey
ILO	International Labour Organization
ISCED	International Standard Classification of Education
ISIC	International Standard Industrial Classification
ISOC	International Standard Occupational Classification
KNBS	Kenya National Bureau of Statistics
NACOSTI	National Commission on Science, Technology, and Innovation
NEET	Not in Education, Employment or Training
PSC	Public Service Commission
SDGs	Sustainable Development Goals
SSA	Sub-Saharan Africa
STEM	Science, Technology, Engineering and Mathematics
STEP	Skills Towards Employability and Productivity
TVET	Technical and Vocational Education Training
UNDESA	United Nations Department of Economic and Social Affairs
UNESCO	United Nations Educational, Scientific and Cultural Organization

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1. Introduction

Science, Technology, Engineering and Mathematics (STEM) education is a curriculum based on the idea of educating students in four specific disciplines, namely science, technology, engineering and mathematics in an interdisciplinary and applied approach. The four specific disciplines explore different aspects of learning as follows: Science, which is a body of knowledge comprising of measurable or verifiable facts acquired through application; Technology, which is the application of knowledge and skills to make goods or to provide services through the use of tools and machines; Engineering, which is the application of science and math to solve problems; and Mathematics, which is the science that developed from the investigation of figures and computing with numbers. STEM skills, therefore, is the ability to identify, apply, and integrate concepts from science, technology, engineering, and mathematics to understand complex problems and to innovate to solve them (Tedor and Ebert, 2017).

In education, STEM means the study of Science, Technology, Engineering and Mathematics either exclusively or in combination while in employment, STEM refers to jobs requiring the application of science, technology, engineering and mathematics skills or a qualification in a relevant subject in a particular industry or sector. Individuals can acquire formal STEM skills and knowledge in different ways, either in formal and non- formal education system such as in the formal educational system, in the workplace or both. This is a channel through which learners acquire more advanced abilities. The key channels for developing STEM knowledge and skills are in primary and secondary schools, tertiary level education institutions such as Technical and Vocational Educations and Training (TVET), apprenticeships, and higher education institutions such as universities.

Job classifications in STEM sectors is complex because many jobs within STEM sectors do not require STEM skills, for example a human resource specialist in an engineering company, while some jobs in non-STEM sectors clearly require STEM skills, for example an Information Technology (IT) support specialist in a law firm. Additionally, there are different definitions as to what makes up a STEM job. Nonetheless, STEM jobs are in most cases identified by the industry in which they are undertaken based on the International Standard Occupational Classification (ISOC) and International Standard Industrial Classification (ISIC) codes, respectively. Each code also covers a wide range of classes of employment and industries.

The United Nations reiterates that STEM skills are essential in boosting productivity in the face of digitalization and Fourth Industrial Revolution. In fact, STEM skills are viewed as 21st century skills able to catalyze creation and sustenance of employment opportunities. Therefore, these skills are important in the attainment of the Sustainable Development Goal No. 8 on decent work and employment (United Nations Department of Economic and Social Affairs-UNDESA, 2021). However, most of the developing countries, including Sub-Saharan African (SSA) face shortage of STEM skills. According to the United Nations World Population Prospects (2019), SSA comprises over 60 per cent of the world population, but only less than 25 per cent of the youths do not possess the STEM skills.

Notably, approximately two-thirds of the youths with STEM skills are in employment. This indicates that these skills have the potential of creating jobs for the youths in Kenya. However, the country still faces shortages in STEM skills despite the rise in youth unemployment from 10.8 per cent to 12 per cent between 2015 and 2020 (Kenya National Bureau of Statistics-KNBS, 2020). Despite government efforts to boost youth employment through various measures, youth employment has not been rising as expected and at the same time the priority STEM skills are scarce in the country. Therefore, to formulate policies and interventions targeted at addressing youth unemployment, calls for the need to comprehend the effect that STEM skills have on youth employment.

STEM skills are critical in sustaining and creating job opportunities, especially the youth. In Kenya, for instance, these skills have been identified as high priority skills in achieving the country's long-term development agenda. Owing to these, the country has initiated several measures to boost the uptake of STEM courses and promote quality training and learning of STEM skills through various regulatory, legislative and institutional frameworks such as the Science, Technology and Innovation Act (2013), establishment of Science and Technology Universities and TVETs, establishment of the National Commission for Science, Technology and Innovation (NACOSTI), and the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA). Currently, only about 13.7 per cent of the youths in Kenya possess STEM skills.

The objective of the study is twofold; first to determine the effect of Science, Technology, Engineering and Mathematics (STEM) skills on youth employment in Kenya, and second to determine the effect of STEM skills on the type of employment contract among Kenyan youths.

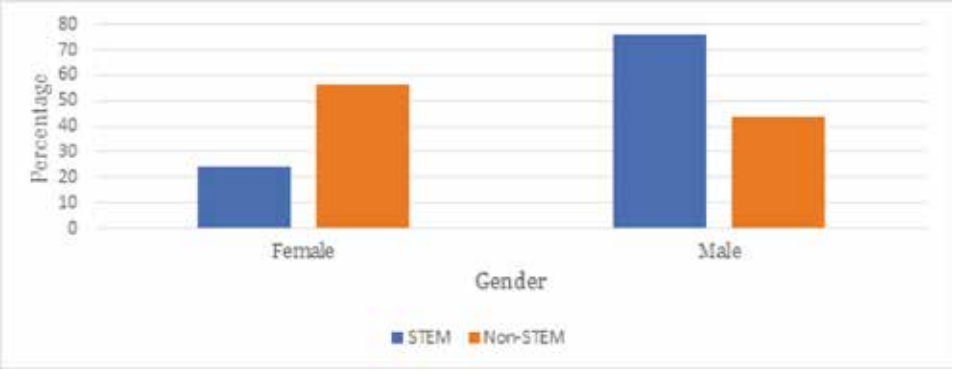
The rest of this paper is organized into the following sections: section 2 presents the stylized facts on STEM skills and youth employment; section 3 provides a detailed review of literature; section 4 presents the study methodology; section 5 presents the empirical results and discussions; while section 6 presents the conclusion and policy recommendations.

2. STEM Skills and Youth Employment in Kenya

2.1 STEM Skills in Kenya

Evidence suggests that there is scarcity of STEM skills in most developing countries. In Kenya, for instance, only 13.7 per cent of youths possess the STEM skills. Furthermore, the analysis on the 2013 STEPS survey data by the World Bank reveal that two in every three youths with STEM skills are employed (World Bank, 2016). This, therefore, reveals that STEM skills have the potential of increasing youth employment. Conversely, low levels of STEM skills in the face of technologically advancing world, compromises the youths' employment opportunities (ILO, 2020). Additionally, From Figure 1, segregating STEM and non-STEM skills in terms of gender reveal that more males have STEM skills (76%) than females. Similarly, 56 per cent of the young females have non-STEM skills compared to their male counterparts (44%). These observations attest to the under-representation of females in possession of STEM skills among the Kenyan youth (World Bank, 2016).

Figure1: Gender segregation of STEM and non-STEM skills among Kenyan youths



Source: Authors' computation from World Bank STEPS Data-2013

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Kenya is therefore leveraging on STEM skills to boost youth employment as they transition from school into the labour force. The Government of Kenya through the Kenya Vision 2030, Medium-Term Plans and the "Big Four" agenda identified STEM skills as high priority human resource skills required in the achievement of its long-term development goals. In Kenya, STEM skills are mostly developed from formal education such as universities and colleges, and training institutions

such as Technical, Vocational and Education and Training (TVET) institutions. The country has made significant progress in terms of increased enrolment in universities and TVETs over the past decade by more than 300 per cent. The challenge, however, is that Kenya like many countries in SSA region face scarcity in STEM skills.

Kenya's long-term development goal is to be an industrial nation by the year 2030 and to achieve this goal, the government identified STEM skills as high priority skills that the workforce should possess to propel the country into an industrializing country. The government also leverages STEM skills in solving the persistent youth unemployment in the country. Therefore, the government has invested in education and training institutions such as TVETs and universities and establishment of institutions such as National Commission for Science, Technology and Innovation (NACOSTI), all aimed at boosting enrolment into STEM courses, STEM skills and ultimately improving youth employability (Government of Kenya 2007; 2012). Despite the numerous government endeavours, majority of the youths are unemployed. This can partly be attributed to the fact that the much-needed STEM skills in an industrializing country such as Kenya are very scarce.

2.2 Youth Employment and STEM Skills

Youth unemployment is becoming a global concern to countries and policy makers. According to the International Labour Organization-ILO (2010), youth unemployment refers to a situation where young people, not involved in either paid employment or self-employment, actively search for job but cannot find any job. A youth in Kenya is any individual within the age group of 18 years and 34 years (Government of Kenya, 2010). The study adopts the International Labour Organization general minimum age for admission to employment or work of 15 years (13 for light work) and the minimum age for hazardous work at 18 (16 under certain strict conditions). Various international initiatives and interventions, notably the United Nations Sustainable Development Goal (UN-SDG) 8 and the African Union Agenda 2063 underscore the pivotal role the youth play in ensuring sustainable economic growth and development of a country. SDG 8 further aimed at reducing the number of youths Not in Employment, Education or Training (NEET) by 2020. Therefore, the need to strengthen job creation opportunities for young men and women (United Nation-UN, 2018).

Globally, youth unemployment rates averaged about 13.7 per cent between 2015 and 2020, indicating a slight increase from 13.3 per cent reported in 2010 (ILO, 2020). Similarly, in Sub-Saharan Africa (SSA) region, about a third of the youths are unemployed, with only one in every six youths being employed (African Development Bank, 2020). In fact, the SSA region experienced a rise in youth unemployment from 10.91 per cent to 11.58 per cent between 2015 and 2020, respectively. Over the same period, the average youth unemployment rate in the East African region stood at 5.6 per cent. Unfortunately, Kenya is not unique to the rising number of unemployed youths. In Kenya, approximately one in every three youths is unable to secure a job, despite actively looking for a job. Additionally,

the country experienced an increase in youth unemployment rate from 10.8 per cent to 12 per cent over the same period, respectively (Kenya National Bureau of Statistics-KNBS, 2020). What is worrying is that youth unemployment in Kenya is very high relative to that of East African region and the SSA region.

The youth unemployment situation is further exacerbated by the fact that the world has been evolving rapidly in terms of advancement in technology, globalization and industrial development that increases demand for skills, especially the Science, Technology, Engineering and Mathematics (STEM) that majority of the youths do not have. The youths comprise about a third of the entire population, therefore presenting an opportunity for the country to get returns from investing in its youthful population through skills such as STEM skills. In an industrializing economy such as Kenya, STEM skills are vital in the labour force. Nurturing and attainment of STEM skills among the youth is, therefore, important in designing interventions meant to address the persistent youth unemployment in the country. This will help the government to upskill and reskill the youths with the STEM skills that have a high probability of creating jobs for the youths and, therefore, boosting youth employment. This study, therefore, aimed at examining the effect of STEM skills on youth employment. Specifically, this study focuses on how STEM skills influence youth employment by decomposing STEM skills in terms of Science, Technology, Engineering and Mathematics. Secondly, this study focuses on how STEM skills influence the type of employment contract based on fixed, permanent and temporary contracts.

3. Literature review

3.1 Theoretical Literature Review

3.1.1 Occupational choice theory

This theory, developed by Ginzberg (1951), states that employment choice is an irreversible progressive process that occurs over time. Further, the process of making employment choices spans from preadolescent up until the late youthful years of an individual and during this period, the individual makes absolute employment choices and commitments, including skills acquisition and educational decisions. Individuals make employment choices by compromising skills, interests, opportunities and values (Ginzberg, 1951; Super, 1956). The theory further states that skills acquisition and educational attainment leads to unalterable improvement in quality of individuals. However, one can change their initial employment choice as changes occurs in the market. Ginzberg (1951) asserts that individuals make employment choices that optimally suit their evolving needs and circumstances. Furthermore, a prospective worker while looking for employment, assesses the gains and skills requirements of a job before finally settling on the choice of employment. Generally, advancement in technologies renders STEM skills among youth people critical in influencing their employment choices. These employment choices include employment in the informal, private and public sectors.

3.1.2 Human capital theory

This theory attempts to underscore the role that human capital plays in boosting employment opportunities. The foundation of this theory lies on the fundamental assumption that education supports development of skills. In other words, education enhances the worker's capabilities to be more productive and hence increasing employment probabilities of skilled workers. This theory, therefore, posits that investment in human capital generates returns in two interlinked channels, namely through increased firm's productivity and wages and salaries for employees and increased employment (Bloch and Smith, 1977). According to Becker (1964), human capital is defined as skills, knowledge and other human traits that increases employability of individuals. This theory assumes that investment or accumulation of human capital is done through three main channels, namely: first is the formal learning where individuals undergo formal education at primary, secondary and higher levels; second is the on-the-job training where individuals undergo post-school training provided by employers, while the third is off-the-job training where individuals participate in post-school training offered by private institutions. This theory is in line with Kenya's Vision 2030 that identifies STEM skills as priority skills in promoting employment especially among the youth. The Vision also identifies education as a vehicle for developing the STEM skills. This theory stipulates that development of human capital in terms of skills such as the STEM skills is critical for a country to increase levels of employment, especially among the youth.

3.1.3 Search theory of unemployment

This theory states that employers constantly seek to employ skilled and productive workers while workers look for well-paying jobs (Tehran, 2001). A worker will move from being unemployed to employed if the demands for employers and workers' match. Unemployment arises when this matching process delays due to friction in the labour market. Furthermore, heterogeneity among workers is the prime cause of friction in the labour market, that obscures the attainment of equilibrium owing to inadequate allocation of skilled workers to available jobs. In a nutshell, this theory factors in the amount of time it takes for unemployed individuals to be employed. The friction in the labour market owing to inadequate or lack of requisite skills increases the search duration that in turn increases the unemployment period for unemployed workers (youths). Therefore, this implies that unemployment occurs the longer it takes for an individual to be employed.

3.1.4 Employability skills theory

According to Nabi (2003), prospective workers are essentially ready for a job if they are equipped with the requisite skills. He further contends that youths must have suitable skills and qualities to become employable. These skills are usually needed in addition to the formal education qualifications that youths possess. Jorgensen (2004) remarked that formal education does not necessarily result to skills required in the labour market, and many youth get disappointed after finishing their studies and are incapable of finding an appropriate job. Employers expect prospective employees to have the requisite skills and knowledge to the companies; however, if this is not the case, then vacancies remain unfilled that in turn cause most of the unskilled workers to remain unemployed. This theory therefore fits into the Kenyan context, as STEM skills are likely to ensure the country and firms remain competitive. On the contrary, inadequate STEM skills are likely to push youths into the unemployment pool or in the informal employment. Several initiatives have been adopted in Kenya to boost STEM skills, such as increasing the number of universities and technical training institutions that aim to increase the supply of STEM skills.

3.2 Empirical Literature Review

This study builds on previous empirical studies that have attempted to examine the effect of various factors on youth employment and type of employment contract such as Bell and Blanchflower (2010), Nyaga, (2010), Caprile et al. (2015), Robalino et al. (2013), Cho, Lee and Kim (2018) and Owino and Wairimu (2018). These studies assessed the effect of STEM skills, gender, age, search duration, experience and education level on youth employment and type of employment contract.

3.2.1 Empirical literature on STEM skills and other factors influencing youth employment

Caprile et al. (2015) examined the effect of STEM skills on employment involving young people. The study documents a positive relationship between STEM skills and youth employment. According to Caprile et al. (2015), employment was found to be very high among youths with STEM skills. Based on the findings, Caprile et al. (2015) remarked that adequate STEM skills among the youth is likely to lead to supply of the much-needed skills in the labour market. Consequently, increasing employment among the youths propels economic growth. Similarly, Bozick, Srinivasan and Gottfried (2017) found a positive relationship between STEM skills and employment among youths who completed secondary education level. Youths with STEM skills are better armed to develop and manage new knowledge and interrelate in environments where technology command their day-to-day responsibilities. This in turn helps the STEM skills youth in boosting their productivity, further making them more likely to gain employment (Goos et al., 2013; Webber, 2014; Peri, Shih and Sparber, 2015; Cho, Lee and Kam, 2018). Robalino et al. (2013) demonstrate that skills influence the choice regarding labour market participation. The study results reveal that skilled individuals, including youths are more probable to participate in the labour force because the opportunity cost of being unemployed is higher. Robalino et al. (2013) contends that skills influence the choices that people have in the labour market, either as formal employees in the public and private sector, self-employed employees or unemployed. Furthermore, employment opportunities are more limited for youths without any university degree or those who only have secondary level education and lower levels of education.

A study by Owino and Wairimu (2018) explored the employment preferences in Kenya using multinomial logit regression analysis and found that skilled youths prefer to be employed in the public sector relative to private sector and self-employment. Based on these findings, Owino and Wairimu (2018) remarked that the public sector offers job security and skills match as opposed to private sector and self-employment. Additionally, youths engage in self-employment as a means of survival, and not necessarily because they have the requisite skills to engage in such a type of employment. The study, however, only focused on skills in general. The current study specifically focuses on STEM skills and its effect on youth employment.

Regarding gender of the youth, Bell and Blanchflower (2010) reveal that female youths are more likely to be unemployed as opposed to their male counterparts. These observations are echoed by (Baah-Boateng, 2009; Kiiru, Onsomu and Wamalwa, 2009; Nyaga, 2010) who consistently agreed that high unemployment rate coupled with the family formation and child-bearing roles female play forces them to participate in self-employment. This type of employment offers women an opportunity for a flexible working schedule as they take care of children and family at large. In addition, distribution of gender roles in community tends to disadvantage women as opposed to men. The women roles such as fetching water,

cooking, taking care of children grounds them at home while men participate in the labour market.

Search duration is the amount of time it takes an individual to secure a job, and this has been identified as a factor that determines youth employment (Anyanwu, 2013; Khainga and Mbithi, 2018; and Berhe, 2020). According to these studies, the longer the search duration, the less likely that the youth will be employed. With the increasing search duration, the intensity of job search is likely to reduce due to frustrations from unfruitful job search, reluctance of firms to employ individuals whose skills are deemed eroded, and loss of connections with the appropriate networks. A study conducted in Kenya by Khainga and Mbithi (2018) found that higher search duration increases youth employment in the public sector and self-employment, but lowers the likelihood of being employed in the private sector. These results conform with human resource strategies by the Public Service Commission (PSC) in Kenya, which seeks to reduce the aging civil service. These strategies include one year PSC internship programme for university graduates.

Khainga and Mbithi (2018) affirm that the education level affects youth employment as it enhances productivity of young people, therefore raising the likelihood of employment. Educational attainment imparts individuals with skills that enables them to work in both formal and informal employment relative to being unemployed. The study findings, however, reveal that increase in education does not always lead to youth employment especially at the tertiary level. The study found out that tertiary education level lowers the likelihood of employment in the public sector as opposed to self-employment. Based on these results, Khainga and Mbithi (2018) remarked that increase in the number of youths with tertiary education level such as university degrees leads to degree inflation phenomenon. This phenomenon occurs when a huge number of graduates increases competition in the labour market and given the few employment opportunities, the university degree loses its value of guaranteeing employment. Thus, majority of the graduates resort to self-employment or advance their studies to earn a competitive edge.

Elima (2015) notes that youths with education are more likely to be employed in three scenarios. Firstly, youths with either primary, secondary or tertiary education level are more likely to be in employment relative to their counterparts without any formal education. Secondly, youths with secondary and tertiary education level are less likely to be in self-employment than in formal employment. Thirdly, youths with primary education level are more probable to be in self-employment that their counterparts with no formal education. These results reveal that education increases the labour force participation among youths.

Age matters for youth employment; for instance, a study by Escudero and Maurelo (2013) indicates that increase in age of youths raises their levels of experience that in turn increases the level of employment. These study results agree with those reported in Ethiopia by Guarcello et al. (2006). The study evidenced that likelihood of youth employment increases with age. These findings are, however, in conflict with those reported in Kenya by Kiiru, Onsomu and Wamalwa (2009). The study established that age and youth unemployment had a positive relationship.

Regarding experience, studies by Grant (2012), Elder (2014), and Elder and Koné, (2014) reveal that employers and firms are frequently hesitant about employing young people as they cite lack of experience. At the same time, labour markets in developing countries mostly do not create employment opportunities for entry-level skills, with most of the advertised job vacancies requiring work experience (Baah-Boateng, 2016). Therefore, these studies consistently agreed that lack of experience among youths hinders their employability, especially in developing countries.

3.2.2 Empirical literature on STEM skills and other factors influencing type of employment contract

A study by Cho, Lee and Kim (2018) shows that youths with STEM skills are better positioned to work in large firms and with permanent contracts and full-time jobs. Similar findings are also reported by Webber (2014). Quite a few studies also find similar results (Sioane and O'Leary, 2005; Chevalier, 2011). Croce and Ghignoni (2020) hypothesized that youth STEM skills were less concerned with part-time and fixed-term contracts or employment in the public sector compared to their counterparts with non-STEM skills. Based on this, the authors remarked that temporary contracts, unlike part-time and fixed terms, offer youth flexibility to engage in other economic and non-economic activities.

Petrongolo (2004) examined the gender segregation in employment contracts in the European Union countries and study findings revealed that women unlike men are over-represented in part-time jobs compared to full-time jobs owing to the women's needs and preference to take care of their child(ren) and immediate family. A similar study by Dolado, Felgueroso and Jimeno (2002) revealed that gender segregation is positively related to part-time jobs where women are forced to opt for employment contracts that are well-matched with their household tasks.

Dolado, Felgueroso and Jimeno (2002) found that age and education level of youths negatively influenced the likelihood of youths opting for part-time employment contracts as opposed to permanent employment contracts. Based on these results, the authors remarked that majority of the younger youths prefer part-time as it offers them flexibility in participating in advancing their education levels. However, as the youths grow older, their preference shifts to permanent employment contracts. Regarding the education level and employment contract, the study found that educated youths were less likely to opt for part-time employment contacts compared to temporary employment contracts.

Regarding job search duration, Vigna (2005) contends that longer job search durations force the youths to lower their reservation wages, thereby these youths are in turn more likely to accept either low-waged temporary or part-time employment contracts relative to high-waged permanent employment contracts. Based on similar argument, Khan (2009) also found that job search duration increased the probability of a youth opting for temporary employment contracts compared to permanent employment contracts.

3.3 Summary of Literature Review

From the reviewed literature, several studies have focused on how STEM skills influence youth employment in the private, public sectors and self-employment. However, none of the studies attempted to disaggregate STEM skills into respective subjects. Furthermore, the literature on how STEM skills influence the type of employment contract and type of occupation is scarce. Therefore, this study contributes to the body of literature in threefold: first, this study focuses on how STEM skills influence youth employment by decomposing STEM skills in terms of Science, Technology, Engineering and Mathematics. Second, this study focuses on how STEM skills influence the type of employment contract based on fixed, permanent and temporary contracts. Third, this study also associates STEM skills by the type of occupation.

4. Methodology

4.1 Research Design

This study adopted the mixed methods research design to establish the effect of STEM skills on youth employment in Kenya. To achieve the first objective of determining the effects of STEM skills on youth employment in Kenya in the study, descriptive statistics was used, including the use of tabulations and frequencies. Two models are used to determine the effects of STEM skills on youth employment and the type of employment contract among the youths in Kenya. A multinomial logistic model is used to establish the probability of a youth with STEM skills being employed in the three employment sectors: private, public and self-employed in Kenya. Next, a similar multinomial logistic model is used to determine the probability of a youth with STEM skills receiving either of the three employment contracts: permanent, temporary and fixed- term in Kenya.

4.2 Theoretical Framework

In most cases, occupational choice models are used in estimating the likelihood of occurrence of certain outcomes such as being employed. As such, simple binary models such as logit and probit or multivariate specification can be used as appropriate. This study uses a multinomial logit methodology to determine the effects of STEM skills on youth employment across different sectors in Kenya and the effect of these STEM skills on the type of employment contract among Kenyan youths. Specifically, the dependent variable is categorical and can take more than two mutually exclusive unordered outcomes. In this case, the employment will capture three employment sectors in the country, which include private sector, public sector and self-employed. In the employment model, j represents the employment sectors ($j=0,\ldots,m$). The model is expressed as (Greene, 2003):

$$Pr(Y_i=j) = e^{(\beta j\, Xi)}/(\sum_{(k\ =\ o)}^{m} e(\beta_j X_i)) \qquad 1$$

Where Y_i is the employment outcome for an individual youth in sector j and X_i is a vector of characteristics, which affects the employment sector which includes individual and household characteristics such as such as age, gender, education attainment, location, residence, STEM skills, among others, and β_j is the covariates on odds of an alternative being selected (Greene, 1997; Maddala, 1983.

In the case of type of employment contract among youths with STEM skills, j represents the three employment options: permanent, temporary and fixed-term contracts ($j=0,\ldots,m$) and X_i is a vector of characteristics that affects the employment sector, which include individual and household characteristics such as age, gender, education attainment, location, residence, STEM skills, among others, and β_j is the covariates on odds of an alternative being selected.

4.3 Empirical Equation

To estimate the effect of STEM skills on youth employment in Kenya, the study estimates a Multinomial Logit (MNL) model as shown below:

$$Employment = \beta_0+\beta_1\ STEM\ skills+\beta_2\ Age+\beta_3\ Gender+\beta_4\ Job\ search\ duration+\beta_5\ highest\ level\ of\ education(by\ STEM)+\beta_6\ Experience+\beta_7\ Type\ of\ skills+\beta_8\ Skills\ development+\varepsilon_i \quad (2)$$

To determine the effects of STEM skills on the type of employment contract among the Kenyan youths, a multinomial logit model is estimated.

$$Nature\ of\ employment = \beta_0+\beta_1\ STEM\ skills+\beta_2\ Age+\beta_3\ Gender+\beta_4\ Job\ search\ duration+\beta_5\ highest\ level\ of\ education(by\ STEM)+\beta_6\ Experience+\beta_7\ Type\ of\ skills+\beta_8\ Skills\ development+\varepsilon_i \quad (3)$$

4.4 Definition and Measurement of Variables

4.4.1 Definition of variables

The survey defined a public or private sector employee as individuals who work for somebody else and receive a salary or wage. Self- employed was captured for both self-employed with hired labour and with no hired labour. Self-employed owners with no hired labour included all respondents who worked on their own (not employed) and are also owners of the self-employed activity and have no hired employees. Self-employed owners with hired labour included all respondents who work on their own (not employed) and who are also the owners of the self-employed activity and have hired other persons to carry out their activity.

In terms of type of employment contract, the study adopted three categories: permanent/long term, temporary and fixed term work. The study adopted the definitions as used in the survey. Permanent work is defined as work that takes place in a permanent fashion or for a long time period, fixed term work is defined as work that takes place for a certain period and not able to be changed while temporary work is defined as work that takes place in a non-regular fashion for a certain time period. The difference between temporary and fixed-term contract is that fixed-term one is one which terminates on a specified date or on the occurrence of an event, which is certain to occur on a particular date. For example, to cover a period of secondment or in-service or educational training; to fill a post pending appointment being made or pending an appointee taking up the post, provided that the permanent appointment is not unreasonably delayed. A temporary contract is normally used when no end date is known and its termination is dependent on an event such as return from sick leave or maternity leave, or completion of a job. For example, to cover sickness; to cover maternity leave where the date that the substantive post holder will return is not known; to cover any other period of paid/unpaid leave where the end date is not known; to

cover a temporary reduction in the hours of a member of staff; to cover a short-term temporary increase in workload.

In this study, skills development was about skills training outside of a formal education programme. The STEPs survey considered individuals to have undergone skills development if they had taken some training courses that lasted at least 30 hours or 5 working days. The training must have been provided inside or outside the workplace by professional trainers. Some examples are studying basic accounting in an evening course, getting trained in new computer software, learning how to operate a specific machine, etc. The courses taken for leisure were excluded, such as exercise classes or dancing lessons, but rather training that improved their skills so that they will have potentially more success in the job market. It also excluded attendance to conferences or seminars, but training that improved specific skills.

The study also adopted the 10 International Standard Classification of Education (ISCED) (UNESCO Institute for Statistics, 2014) to decompose the STEM skills into Science, Technology, Engineering and Mathematics. The same was adopted to classify skills into STEM and non-STEM skills. These 10 classifications include: Education; Arts and Humanities; Social Sciences, Journalism and Information; Business, Administration and Law; Natural Sciences, Mathematics and Statistics; Information and Communication Technology; Engineering, Manufacturing and Construction; Agriculture, Forestry, Fisheries and Veterinary; Health and Welfare and Services.

The study also adopted the 1-digit International Standards Classification of Occupations Rev. 8 occupation code. The employment are classified depending on the level of skill classified from skill level 1 to skill level 4, with skill level 1 comprising simple and routine physical or manual tasks and with the required competence performance being primary education or first stage level of education required and skill level 4 comprising performance of tasks that require complex problem-solving, decision-making and creativity based on extensive body of theoretical or factual knowledge in a specialized field. Competent performance in skills level 4 is associated with higher education comprising 3 to 6 years of higher education for a first degree or even higher attainment. The background on skills level then informs the classification of employments into managers, professionals, technicians and associate professionals, clerical support, service sales workers, plant machine operators and elementary employments with managers, technicians and associates professionals having the highest skills level 4 and elementary employments associated with skills level 1.

The study adopted the working age of youths within the working age population of 15-34 years as used in the STEP survey. This was also important in incorporating youths working through apprenticeship, internships and other forms of work allowed for youths under the age of 18 years. This also allows the study to incorporate youths who joined TVET institutions after primary level, who are exposed to employment opportunities before the age of 18 years. The law under the Employment Act, 2007 and the Children Act defines a child in Kenya as a person below the age of 18 years. The Employment Act, Part VII, provides for protection

of children including protection from the worst forms of child labour and allows employment of children from the ages of 13 to 16 years for light work and defines those of 16 to 18 as employable. The International Labour Organization sets the general minimum age for admission to employment or work at 15 years (13 for light work) and the minimum age for hazardous work at 18 (16 under certain strict conditions).

4.4.2 Measurement of variables

Table 1: Measurement of variables

Dependent variables	**Variable type**	**Categories**	**Expected sign**
Employment	Categorical	1=private sector employment 2=public sector employment 3=self-employment	
Type of employment contract	Categorical	1=Temporary 2=Permanent 3=Fixed term	
Independent variables		Measurement	Expected sign
Age	Years	continuous -Age in years (15 – 34 years)	-/+
Gender	Dummy	0=Female 1=Male	-/+
Type of skills	Dummy	0=Non- STEM skills 1=STEM skills	+
STEM skills	Categorical	1=Science 2=Technology 3=Engineering 4=Mathematics	
Highest level of education (by STEM)	Categorical	0=None 1=Primary 2=Secondary 3=Tertiary	+
Job search duration	Months	Number of months it takes a youth to find a job	-
Skills development (Skills outside formal education)	Dummy	1=Yes 0=No	+

4.5 Data Sources

The study uses the World Bank Skills Towards Employability and Productivity (STEP) 2013 survey data for estimations. Specifically, the paper uses the STEP Skills Measurement Household Survey 2013 (Wave 2). This is a cross-sectional data involving 3,894 households whose information was collected through questionnaires of a representative sample of adults aged 15 to 64 living in urban areas, whether they work or not. The Kenya sample design was a stratified 3 stage sample design. The sample was stratified by 4 geographic areas: 1-Nairobi, 2-Other Large Cities (over 100,000 households), 3- Medium cities (60,000 to 100,000 HHs), and 4-Other Urban Areas with an overall response rate of 91.8 per cent. The multi-country research programme was undertaken to determine how different skill sets affect an individual's labour market opportunities. Specifically, the STEP survey was designed to better understand the interplay between skills and labour market outcomes such as employability and productivity. The individual is the unit of analysis in this survey and thus will be the unit of analysis for this study. The survey has modules that measure the job-specific skills (subset of transversal skills with direct job relevance), cognitive skills and socio-emotional skills of a representative sample of adults within the working age population of 15 to 64 years living in urban areas, whether working or not. The data collected several indicators such as household demographic characteristics (age, gender, residence and marital status), education and training attainment (formal and non-formal education, highest education attained and field of study), job skills requirements (job-relevant skills and skills acquisition history) and labour market outcomes (employment status, type of occupation and type of employment contract. The dependent variable was the measure of labour market outcomes in terms of employment status (public, private, self-employed) and type of employment contract (temporary, fixed-term and permanent).

4.6 Descriptive Statistics

On the type of employment contract by the Kenyan youth, 35 per cent and 63.7 per cent had temporary and permanent employment contracts, respectively, while only 1.3 per cent had fixed-term contracts. On the employment sector, 53.7 per cent of the youth were employed in the private sector, 7.1 per cent were employed in the public sector and 39.2 per cent were self-employed. The average age of the youths was 25.2 years with a minimum and maximum of 15 and 34 years, respectively.

On gender, 43.2 per cent of the youth were female while 56.8 per cent were male. On highest level of education by STEM skills, 26.6 per cent of the youth had no education, 0.03 per cent had primary level of education, 0.2 per cent had secondary level of education, and 73.2 per cent had tertiary level of education. On the specific STEM area of specialization among the youths, 7.2 per cent had skills in sciences, 20.4 per cent had skills in technology, 5.3 per cent had skills in engineering, and 67.1 per cent had skills in mathematics. The average job search duration among the youth was 13.3 months with a minimum of less than a month

and a maximum of 204 months. On experience, 17.3 per cent of the youth had no work experience, 57.9 per cent had work experience of below one year, 13.9 per cent had work experience of between 1-2 years and 10.9 per cent had work experience of 3 years and above.

Table 2: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Type of Employment Contract					
Temporary	2,220	0.350	0.477	0	1
Permanent	4,036	0.637	0.481	0	1
Fixed term	82	0.013	0.113	0	1
Employment Sector					
Private sector	3,400	0.537	0.499	0	1
Public sector	450	0.071	0.257	0	1
Self employed	2,483	0.392	0.488	0	1
Age	10072	25.228	4.555	15	34
Gender					
Female	4,351	0.432	0.495	0	1
Male	5,721	0.568	0.495	0	1
Highest level of education (by STEM skills)					
None	790	0.266	0.442	0	1
Primary	1	0.0003	0.018	0	1
Secondary	6	0.002	0.045	0	1
Tertiary	2,172	0.732	0.443	0	1
STEM skills					
Science	156	0.072	0.258	0	1
Technology	445	0.204	0.403	0	1
Engineering	115	0.053	0.224	0	1
Mathematics	1,463	0.671	0.47	0	1
Job search duration(months)	6221	13.255	13.234	0	204
Experience					
No Experience	1,176	0.173	0.378	0	1
Below 1 year	3,932	0.579	0.494	0	1
1 – 2 years	947	0.139	0.346	0	1
3 years and above	737	0.109	0.311	0	1

Skills development					
No skills development	9,108	0.904	0.294	0	1
Undertook skills development	964	0.096	0.294	0	1
Skills type					
None STEM skills	3,239	0.601	0.49	0	1
STEM skills	2,154	0.399	0.49	0	1
STEM skills by Employment Type					
Managers	5	0.002	0.048	0	1
Professionals	36	0.017	0.128	0	1
Technicians	34	0.016	0.125	0	1
Clerical support	24	0.011	0.105	0	1
Service sales workers	16	0.007	0.086	0	1
Plant machine operators	6	0.003	0.053	0	1
Elementary employment	2,025	0.944	0.231	0	1

Source: Own computation using STEP 2013 data

On skills development, 90.4 per cent of the youth had not undertaken any form of skills development while 9.6 per cent had undertaken skills development. On STEM skills type among the youth, 60.1 per cent had no STEM skills while 39.9 per cent had STEM skills. On STEM skills by employment, 0.2 per cent youth were managers, 1.7 per cent were professionals, 1.6 per cent were technicians, 1.1 per cent were offering clerical support, 0.7 per cent were working as service sales workers, 0.3 per cent were plant machine operators and 94.4 per cent had elementary employment.

Table 3: Employment sector by STEM skills, gender and type of skills

Employment sector	Science	Technology	Engineering	Mathematics	Female	Male	STEM skills	Non-STEM skills
Private Sector	53.2	89.0	57.6	49.6	34.1	62.7	61.6	49.4
Public Sector	27.5	1.8	9.5	45.6	1.8	9.4	29.6	1.3
Self-employed	19.3	9.2	32.9	4.8	64.1	27.9	8.8	49.3
Total	100	100	100	100	100	100	100	100

Source: Own computation using STEP 2013 data

Further disaggregation of the summary statistics shows that the private sector is the highest employer of youth with STEM skill for each category. The sector employs 53.2 per cent youths with science skills, 89.0 per cent of youths with technology-related skills, 57.6 per cent of youths with engineering skills and 49.6 per cent of youths with mathematics skills. The public sector is the second most employer for youths with mathematics and science skills at 45.6 per cent and 27.5

per cent, respectively. Self- employment is the second most employer for youths with engineering skills at 32.9 per cent. Overall, the private sector is also the highest employer of youths with STEM skills by 61.6 per cent compared to the public sector and self- employment at 29.6 per cent and 8.8 per cent, respectively. In addition, most of the females are employed in the private sector at 64.1 per cent, while 34.1 per cent and 1.8 per cent are self-employed and in the public sector, respectively. Majority of males are employed in the private sector at 62.7 per cent, while 27.9 per cent and 9.4 per cent are self-employed and in the public sector, respectively.

In terms of STEM skills distribution by gender (Appendix 2), majority of both male and female youths have Mathematics skills at 65.1 per cent and 73.2 per cent. Among the female youths, 12 per cent, 11 per cent and 4 per cent have science, technology and engineering skills, respectively, while among the male youths, 24 per cent, 6 per cent and 5 per cent have technology, engineering and science skills, respectively.

Disaggregation of descriptive statistics by type of employment contract by specific STEM skills indicate that majority of the youths with science, engineering and mathematics skills have permanent type of employment at 54 per cent, 61 per cent and 93 per cent, respectively. 84 per cent of youths with engineering skills are mainly in temporary employment with only 15 per cent and 1 per cent in permanent and fixed term employment, respectively.

Table 4: Type of employment contract by specific STEM skills

Type of employment contract	Science	Technology	Engineering	Mathematics
Temporary	35.5	83.8	29.8	5.6
Permanent	53.6	14.8	60.7	92.8
Fixed term	10.9	1.4	9.5	1.6
Total	100	100	100	100

Source: Own computation using STEP data

5. Results and Discussion

5.1 Findings

This section presents the study findings and results from the data analysis. Discussions of the findings in triangulation with previous studies were incorporated. The study used the World Bank's Skills Towards Employability and Productivity (STEP) household survey. The STEM skills were decomposed into Science, Technology, Engineering and Mathematics (STEM). In addition, a combined approach was also used to compare STEM skills and non-STEM skills.

The residuals for the estimated models followed a normal distribution ($p<.05$). Multicollinearity was not a major problem as the mean VIF was 4.75 for the model on employment and 5.11 on the model on type of employment contract, which were less than the conventional VIF of 10. Robust standard errors were used to control for heteroscedasticity for the model on employment. Heteroscedasticity was not a major problem for the model on type of employment contract. The multinomial logit regression uses maximum likelihood estimation. A key assumption of the estimator is that the outcome categories of the model have the property of Independence of Irrelevant Alternatives (IIA) (Appendix 1). Multinomial Logit (MNL) model is valid under the IIA assumption that asserts that characteristics of one outcome category do not affect the relative likelihood of opting for other outcome categories. Employment choices in the private sector and public sector are close alternatives, meaning exclusion of any of them affects the relative likelihood of the remaining alternative (self-employment). Further, temporary employment is a close alternative to fixed-term contract employment. When the IIA assumption fails to hold, then the MNL model gets complicated. Therefore, this necessitated the use of Hausman and McFadden (1984) specification test to validate the IIA assumption of the MNL model. The test results revealed that there was no violation of the IIA assumption in each of the two MNL models, and this gave the green light for the current study to employ MNL model for estimation purposes.

Table 5: Effects of STEM skills on youth employment

Variable name	Public Sector	Self-Employment	
Age	0.996 (0.057)	0.923* (0.04)	
Male	0.833 (0.337)	0.247*** (0.077)	
Secondary	0.905 (1.216)	17.981** (21.156)	
Tertiary	0.976 (1.246)	11.798** (13.272)	
Technology	0.017*** (0.013)	1.161 (0.563)	
Engineering	0.104*** (0.08)	2.215 (1.14)	
Mathematics	0.382** (0.166)	0.254*** (0.118)	
Job search duration	1.125*** (0.017)	1.043** (0.017)	
Below 1 year	2.253 (1.776)	0.746 (.314)	
1 – 2 years	2.123 (1.664)	.534 (0.234)	
Above 3 years	41.777*** (34.971)	0.472 (0.414)	
Skills development	1.482 (0.615)	0.108*** (0.044)	
STEM skills	0.826 (0.637)	0.577 (0.449)	
Constant	0.093 (0.199)	1.845 (3.13)	
Mean dependent var	1.460	SD dependent var	0.635
Pseudo r-squared	0.626	Number of jobs	1,312
Chi-square	1,408.200	Prob > chi²	0.000
Akaike crit. (AIC)	899.099	Bayesian crit. (BIC)	1,044.120
*** p<0.01, ** p<0.05, * p<.1			

Note: Robust standard errors are in parenthesis. Coefficient different from zero at 1(***), 5(**), 10(*) per cent significance levels, respectively.

Source: Own computation using STEP 2013 data

Objective one sought to determine the effect of STEM skills on youth employment in Kenya. The dependent variable was categorical—private sector, public sector, and self-employment. Employment in the private sector was used as the base category. The findings indicate that age, gender, highest level of education attainment by STEM specialization areas, the specific STEM specialization areas, job search duration, experience, and skills development outside formal education had a significant effect on employment among the youth in Kenya.

Particularly, the results indicate that youth are 0.923 times less likely to enter self-employment for every additional year in age. This may be associated with the fact that age of prospective employees is important in efforts to acquire a paid job. Increase in age is associated with a high level of experience (Escudero and Maurelo, 2013) and as the youths advance in age, so is their level of experience and chances of getting a paid job. In addition, the study found that males were 0.247 times less likely to enter self-employment compared to females. Therefore, females are more likely to embrace self-employment, and this may be associated with the flexibility to combine work and other household responsibility (Pernilla et al., 2008), compared to wage employment in the public and private sectors. Tumwasi (2015) also found that men have a high probability of selection into formal sector employment (public and private), with a reverse to self-employment and not working.

On the highest level of education attainment by STEM skills, youth with secondary and tertiary level of education and possessing STEM skills were 17.981 and 11.798 times more likely to enter self-employment, respectively, compared to those with no education attainment. Nurturing young people with STEM skills all the way from secondary to tertiary level increases their chances of being self-employed. Therefore, the education channels used to nurture STEM skills should also introduce learning of basic entrepreneurship skills along the process. Some studies found a positive relationship between education and youth self-employment (Blanchflower, 2004; Rees and Shah, 1986; Wiklund and Hellerstedt, 2004). As the level of education increased, the probability of one engaging in self-employment also increases. The positive relation between education and self-employment can be attributed to increase in awareness and the capacity to identify self-employment opportunities. Education also increases the managerial capability, which is needed in self-employment to increase the chances of being successful (Nadia et al., 2013; Wiklund and Hellerstedt 2004).

On the specific STEM specialization areas, youth with skills in technology were 0.017 times less likely to be employed in the public sector compared to those with skills in sciences. Youth with skills in engineering were 0.104 times less likely to have employment in the public sector compared to those with skills in sciences. Moreover, youth with skills in mathematics were 0.382 times less likely to get employed in the public sector and 0.254 times less likely to embrace self-employment compared to those with skills in sciences. The public sector employs very few of the different STEM skills compared to other sectors. Generally, employment opportunities in government are very limited compared to the high numbers of unemployed youths in the country.

The youth were 1.125 times more likely to get employed in the public sector and 1.043 times more likely to enter self-employment for every addition month spent searching for a job. These results conform with Khainga and Mbithi (2018) findings that higher search duration increases youth employment in the public sector and self-employment but lowers the likelihood of being employed in the private sector. In addition, youth with work experience of 3 years and above were 41.777 times more likely to get employment in the public sector compared to youth with no experience. This disadvantages fresh graduates with no work experience. Government interventions have been made through the Public Service Commission to place fresh graduates into internship programmes within the public sector to gain experience through on-job training, which is expected to improve their employability. Those with skills development outside the formal education were 0.108 times less likely to embrace self-employment compared to those without skills development outside formal education. The development of skills can contribute to structural transformation and economic growth by enhancing employability and labour productivity, and helping individuals to become more competitive in wage employments in present and future opportunities (UN, 2018)

Table 6: Effects of STEM skills on type of employment contract among youths

Type of employment contract	Temporary	Fixed
Age	1.005 (0.042)	.927 (0.065)
Male	0.888 (0.268)	0.414* (0.199)
Secondary	15.081** (17.738)	2.024 (2.753)
Tertiary	4.988	1.448
	(5.602)	(1.736)
Technology	4.322*** (1.752)	0.95 (0.722)
Engineering	1.936 (0.933)	2.438 (1.861)
Mathematics	0.369** (.149)	0.311* (.211)
Job search duration	0.973* (0.014)	0.984 (0.023)
Below 1 year	1.473 (0.609)	1.064 (0.726)

1 – 2 years	0.135*** (0.061)		0.481 (0.332)
3 years and above	0.097*** (0.061)		.164 (0.206)
Skills development	9.303*** (2.709)		3.851*** (1.951)
STEM skills	4.497 (4.338)		0.388 (0.321)
Constant	0.018** (0.034)		2.617 (5.922)
Mean dependent var	1.713	SD dependent var	0.496
Pseudo r-squared	0.624	Number of obs	1,312
Chi-square	1161.765	Prob > chi²	0.000
Akaike crit. (AIC)	757.397	Bayesian crit. (BIC)	902.418
*** p<0.01, ** p<0.05, * p<.1			

Note: Robust standard errors are in parenthesis. Coefficient different from zero at 1(***), 5(**), 10(*) per cent significance levels, respectively.

Source: Own computation using STEP 2013 data

The second objective sought to determine the effect of STEM skills on nature of employment among Kenyan youth. Type of employment contract was categorical with three levels—temporary, fixed contract, and permanent. The permanent employment category was used as the base category. Gender, highest level of education by STEM skills, STEM subjects, job search duration, experience, and skills development outside formal education had a significant effect on the type of employment contract. While undertaking literature review, there were no empirical studies to infer on the type of employment contract among youth with STEM skills. This paper will therefore contribute to creating new knowledge in this research area.

The findings indicate that males are 0.414 times less likely to have fixed-term contracts compared to females. On the level of highest education attainment by STEM skills, the results indicate that youth possessing secondary level of education and possessing STEM skills were 15.081 times more likely to have temporary employment contracts compared to youth with no education attainment. STEM skills are known to incorporate some experiments and practicals in secondary school, which could give secondary school graduates an edge in securing

temporary contracts in employments that require skills level 2 for competency and performance.

On the type of employment contract and STEM specialization areas, youth with skills in technology were found to be 4.322 times more likely to have temporary employment contracts compared to those with skills in sciences. Youth with skills in mathematics were 0.369 times less likely to have temporary employment contracts and 0.311 times less likely to have fixed-term employment contracts compared to youth with skills in sciences. Though not disaggregated by specific STEM skills categories, some studies show that youths with STEM skills are better positioned to work in large firms and with permanent contracts and full-time jobs (Cho, Lee and Kim, 2018; Webber, 2014; Chevalier, 2011; Sloane and O'Leary, 2005). The youth were found to be 0.973 times less likely to end up with temporary employment contracts if the search duration increased by an additional month. On experience, youth with 1-2 years of experience were 0.135 times less likely to have temporary employment contracts compared to youth with zero years of experience.

Further, youth with at least 3 years of experience were found to be 0.097 times less likely to have temporary employment contracts compared to those with no experience. Additionally, youth with skills development outside formal education were 9.303 times more likely to have temporary employment contracts and 3.851 times more likely to have fixed-term employment contracts compared to those without skills development outside formal education.

6. Conclusion and Policy Implications

Adopting appropriate technologies leads directly to higher productivity, which is key to growth and job creation. The key to development of these technologies are Scientists, Technologists, Engineers and Mathematicians. The study examined the effects of STEM skills on youth employment and the type of employment contract in Kenya. Specifically, the study decomposed the STEM skills into Science, Technology, Engineering and Mathematics. This was useful in informing the specific STEM areas and their contribution to youth employment and the type of employment contract among the youths. In addition, a combined approach was also used to determine the effects of STEM skills and Non-STEM skills on youth employment and type of employment contract in Kenya.

Findings from the study show that youth with the secondary and tertiary level of education and possessing STEM skills were more likely to enter self-employment compared to those with no education attainment. This indicates that there are opportunities for self-employment among youths with STEM skills. Therefore, it is important to support young people in creating their own (formal or informal) employment opportunities, by teaching entrepreneurial skills, book-keeping skills, finance and leadership skills to prepare them for self-employment and as job creators and or employees. The government could also encourage more youth into self-employment in STEM through incentives such as startup capital and innovation hubs.

In addition, other factors such as work experience increase youth employability in the public sector compared to those with no work experience. Therefore, the government in partnership with the private sector could consider additional investments in internships and apprenticeship opportunities for young people in STEM to increase their chances of employability. Long job search duration also increases the chances of employment in the public sector and self- employment. Given the limited job opportunities in the public sector, self-employment may have a high capacity of absorbing more youths, and the government through relevant ministries and agencies could create a conducive business environment through institutional and legal frameworks to support the young STEM self- employed population and incentivize them to create jobs for others.

On the effects of STEM skills on the type of employment contract, youths with technological skills were more likely to have a temporary contract compared to those with science skills and permanent jobs. In addition, those with secondary school level of education and with STEM skills were more likely to find temporary employment compared to those with no education. This indicates the importance of education in securing a job opportunity for youths. Therefore, the government through the Ministry of Education could continue advocating for the 100 per cent transition of students from one level of education to another and more so for students in STEM to build a knowledge and skills base in STEM for the country.

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Appendix

Appendix 1: Diagnostic test results

Diagnostic test	Model 1 (Youth Employment)	Model 2 (Type of employment contract)
Normality	p-value=.0000	p-value=.0000
Multicollinearity	Mean VIF=4.75	Mean VIF= 5.11
Heteroscedasticity	96.80 p=value=0.0000	3.69p-value=0.0549
IIA	P-value=.0000	P-value=.0000

Appendix 2: STEM skills by gender

STEM skills	Female	Male
Science	12.3	5.4
Technology	11.0	23.6
Engineering	3.5	5.9
Mathematics	73.2	65.1
Total	100	100

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